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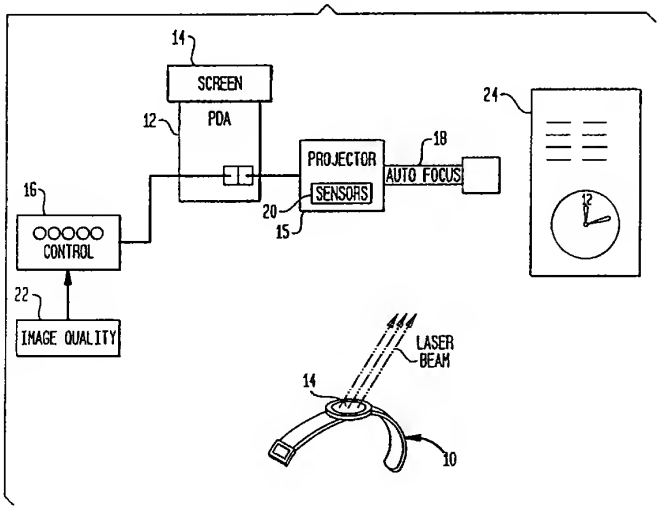
(54) Devices with embedded projectors

(57) Miniature devices (10) which incorporate data displaying features (14), incorporating an information processing and display system (12 to 22), which includes devices for the representation of textural and pictorial information and data, and which is adapted to project images (24) onto a remote display surface. Also disclosed is a method for utilising miniature information processing devices which incorporate projectors for projecting data onto remote surfaces.

FIG. 1



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Description

[0001] The present invention relates to devices which incorporate data displaying features. Moreover, the invention is further directed to the provision of an information processing and display system, which includes devices for the representation of textural and pictorial information and data, and which is adapted to project images onto a remote display surface. In addition thereto, the invention is directed to a method for utilising information processing devices which incorporate projectors for projecting data onto remote surfaces.

[0002] The invention seeks to provide a system and/or a method for overcoming the problem of projecting images onto remote surfaces, such as screens, ceilings, walls or the like through the intermediary of projecting devices which may be in the nature of readily portable or easily carried arrangements.

[0003] According to one aspect of the present invention an information processing-display system comprises, a data processing device, including a display for viewing processed data, and, enclosed by or embedded in the casing of the data processing device: a projector module for projecting the data onto a remote screen and a control device for processing data through said projector module and for controlling the quality of the projected display on said screen.

[0004] According to a second aspect of the present invention there is provided, an information processing-display system, comprising embedded in a miniature casing of one or a plurality of data processing devices, including a miniature display for viewing the data; a projector module facilitating projecting the data onto a remote screen; and a control device for processing data through said projector module and for controlling the quality of the projected display on said screen.

[0005] According to a third aspect of the present invention, an information processing-displaying method, comprises embedding in a miniature casing of one or a plurality of data processing devices, including a miniature display for viewing the data; a projector module projecting data onto a remote screen; and a control device processing data through said projector module for controlling the quality of the projected display on said screen.

[0006] Preferably the control device is equipped with a focus system for focusing the images projected onto said screen. Also in such a case the focus is preferably regulated automatically.

[0007] The screen is advantageously selected from the group consisting of a standard screen for projectors, a paper, a floor, a ceiling, wall, any cover of any form, such as square, circle, oval, or polygon.

[0008] Preferably said control device is equipped with a subsystem facilitating control over the form of a boundary of a display on a screen, such as square, circle, oval, or polygon. In such a system, said subsystem is preferably operated automatically using data obtained from sensors.

[0009] Preferably said control device is equipped with sensors for sensing and measuring environmental conditions.

[0010] Such sensors may include a camera or a video camera.

[0011] Further in said system or method the miniature display can with advantage be employed as an output means for projector beams.

[0012] The displays may be glasses.

[0013] Accordingly, pursuant to the present invention there is provided an information processing and image displaying system which may incorporate at least one or possibly a plurality of embedded or encapsulated data processing devices having a miniature display for watching this data. An embedded module of the system facilitates the projection of the data onto remote screens or surfaces, whereas furthermore, a control device may be provided and which is adapted to process data through a projector module so as to manipulate or control the quality of the display on the surface onto which the data or pictorial representation has been projected.

[0014] In order to achieve the foregoing, pursuant to the invention, the miniature object which is equipped with the information processing and playing system, may be a suitably small and portable article; for example, such as a PDA, a clock, a portable telephone incorporating a display screen, a web telephone, a smart telephone, a pager, a smart wallet, a smart key, a wrist watch or pocket watch, or the like among numerous other articles.

[0015] The embedded data processing device incorporates a projector module which may be equipped with a laser device for producing and projecting high-quality contrast images; and wherein a control device facilitates varying the image quality, intensity of colours, clarity and contrast through the intermediary of sensors which measure environmental or surrounding conditions. These conditions are, essentially, the presence of lighting proximate a projector module, lighting proximate a screen onto which the image is projected, and are additionally a measurement of wind, rain, distances from the screen and the projector, and the measurement of the boundary or confines of the screen.

[0016] Moreover, the control device may be equipped with a focusing system which facilitates the focusing of images on the screen, and may also incorporate a subsystem for the automatic regulation of image quality, intensity of colours, and image contrast depending upon data derived from the sensors which measure the environmental or surrounding conditions, such focusing is being adapted to be actuated in an automatic manner.

[0017] Reference may now be had to the following detailed description of preferred embodiments of the invention, taken in conjunction with the accompanying drawings; in which, by way of example:

Figure 1 illustrates a generally schematic block cir-

cuit diagram of a projection system which is embedded in a miniature-sized article;

Figure 2 illustrates the projection of an image from a wrist watch possessing an embedded projection system for information processing and projecting an image display onto a surface in the nature of a room ceiling;

Figures 3a and 3b illustrate a projection module utilising, respectively, a laser and miniature arc lamp for a monotone projection;

Figure 4 illustrates top, side and bottom views of a PDA with a laser projection module which is adapted to be incorporated into a miniaturised article;

Figures 5a and 5b illustrate a colour projection module utilising, respectively, a laser and miniature arc lamp; and

Figure 6 illustrates top, side and bottom view of a PDA with an arc lamp projection module adapted to be utilised in connection with a miniaturised device pursuant to the invention.

[0018] Referring in specific detail to Figures 1 and 2, a wrist watch 10 possesses embedded therein, a PDA 12 and display 14, and includes a control unit or module 16 operatively connected to the PDA device 12. Moreover, a projector module 15 includes an automatic focus 18 and sensors 20 for sensing external environmental and surrounding conditions.

[0019] An image quality module 22 is operatively connected to the control unit 20, and wherein a laser beam LB is adapted to be projected or beamed from the projector 15 so as to provide an image on a remote screen 24; in this instance, displaying a representation of a clock and other data, as shown in generally diagrammatic illustration.

[0020] As shown in Figure 2 of the drawings, the laser beam LB may be projected against the ceiling 26 of a room, which essentially forms the screen or remote viewing surface, so as to display the image; i.e., the clock or time, shown in Figure 1 in that enlarged manner. Naturally, other surfaces, such as vertical walls, floors, standard projection screens, sheets of paper or any other suitable surface, irrespective as to whether flat or somewhat curved, may be adapted to have the image and data projected thereon by means of the present projection system.

[0021] As illustrated, the projector module 15 is equipped with a laser device 30 for the generating of laser beams LB projecting high quality images of the data display 14 onto the remote screen.

[0022] The control unit or module 16, as shown in Figure 1, is adapted to provide a control over variations in image quality, intensity of colours, clarity and contrast in correlation with the function of the sensors 20 which sense and measure environmental or surrounding conditions, such as the lighting proximate the projector module, lighting which is encountered near the remote screen onto which the data or image is to be projected, and weather conditions such as wind and rain, distance of the projector module or laser device from the screen, and adapted to provide a boundary for the screen.

[0023] Moreover, the focusing of the image is implemented by means of the automatic focus device 18 providing a system which enables the appropriate focusing of images or data onto the remote screen, and which may also be equipped with a subsystem for the automatic and concurrent control over image quality, intensity of colours, and contrast depending upon data received from the sensors which sense and measure environmental or surrounding conditions. As indicated, the focus 18 is preferably automatically controlled.

[0024] Furthermore, the control unit or module 16 may also be equipped with a suitable subsystem which is also adapted to regulate or control the form of the boundary of the display on the screen, such as in the shape of a square, circle, oval, polygon or any other suitable configuration. This control subsystem may be automatically operated in response to the data received from the sensors.

[0025] The sensors 20, as schematically indicated, may include a video camera or any other kind of camera system.

[0026] Although the miniature device is illustrated to be a wrist watch 10, it may also be a PDA, a clock, a telephone equipped with a display screen, a web phone, a smart phone, a pager, a smart wallet, a smart key, or a pocket watch or wrist watch, among other suitable small- sized or miniature objects which may be either worn or carried on the body of a person, carried in a readily portable manner, such as in a briefcase, or installed in a home, office or automobile, as may be required.

[0027] Referring to Figures 3a, 3b and 4 of the drawings, there is illustrated a projection module utilising a system of laser illumination in Fig. 3a and a system of arc lamp illumination in Fig. 3b and 6 showing the projection of the date display onto the screen from the embedded system.

[0028] Figures 5a and 5b illustrate top, front and side views of a colour projection module utilising, respectively, a laser illumination system and miniature arc lamp illumination system wherein rather than in a single monotone, there may be projected red, green and blue solid state laser optics, or electronic colour filters, as applicable.

[0029] In essence, the projector module may be comprised of an illumination source, illumination optics, an image forming module, and a projection lens. The illumination source can be a miniature solid state laser device or a miniature high intensity lamp such as metal halide arc lamp. For lamp illumination, the illumination

optics may also include polarisation conversion optics to provide polarised light with optimum efficiency. The illumination light is directed onto the image forming module by the illumination optics. The image forming module is a miniature light valve, such as a transmission or reflective liquid crystal light valves. Liquid crystal transmission light valves as small as 0.25" diagonal are commercially available today (Kopin Corp.). A lens is used to magnify and project the image through the light valve onto a screen.

[0030] Alternatively, the PDA or the projector module may be equipped with an arc lamp illumination system rather than laser as illustrated in Figures 3B, 5 and 6 of the drawings which is similar in operation to the laser illumination but, in this instance, utilises an arc lamp system.

[0031] For colour application, two types of projectors can be employed. The first uses a light valve where each displayed pixel is composed of three sub-pixels, one for each colour component (red, green and blue). Each of the three sub-pixels includes a different colour filter, one green, one red and one blue. The number of sub-pixels in the light valve is therefore 3X the displayed pixels. In this mode, white light illumination is used to illuminate the light valve. The transmitted light is filtered into red, green and blue to form the full colour image.

[0032] While there has been shown and described what are considered to be preferred embodiments of the invention, it will, of course, be understood that various modifications and changes in form or detail could readily be made without departing from the spirit of the invention. It is, therefore, intended that the invention be not limited to the exact form and detail herein shown and described, nor to anything less than the whole of the invention herein disclosed as hereinafter claimed.

Claims

1. An information processing-display system, comprising a data processing device, including a display for viewing processed data, and, enclosed by or embedded in the casing of the data processing device: a projector module for projecting the data onto a remote screen and a control device for processing data through said projector module and for controlling the quality of the projected display on said screen.

2. An information processing-display system, comprising embedded in a miniature encasing one or a plurality of data processing devices including a miniature display for viewing the data; a projector module facilitating projecting the data onto a remote screen; and a control device for processing data through said projector module and for controlling the quality of the projected display on said screen.

3. An information processing-displaying method, comprising embedding in a miniature encasing one or a plurality of data processing devices including a miniature display for viewing the data; a projector module projecting data onto a remote screen; and a control device processing data through said projector module for controlling the quality of the projected display on said screen.

4. A system or a method as claimed in any preceding claim, wherein the data processing device is selected from the group consisting of a PDA, clock, a telephone with screen, web-phone, smart phone, pager, a smart wallet, a smart key, watch, and glasses connected to the embedded device.

5. A system or method according to any preceding claim, wherein said projector module is equipped with a laser device for projecting high quality contrast images onto said screen.

6. A system or method according to any preceding claim, wherein said control device varies the image quality, intensity of colours, clarity and contrast of the images projected onto the screen.

7. A system or method according to any preceding claim, wherein said control device is equipped with sensors for sensing and measuring environmental conditions.

8. A system or method according to any preceding claim, wherein said environment conditions may comprise one or more of lighting near the projector module, lighting near the screen, wind, rain, distance from a screen, or form the boundary of the screen.

9. A system or method according to any preceding claim, wherein said control device is equipped with a focus system for focusing the images projected onto said screen.

10. A system or method according to any preceding claim, wherein said control device is equipped with a subsystem for an automatic control over the projected image quality, intensity of colours, contrast depending upon data obtained from the sensors which sense and measure the environmental conditions.

FIG. 1

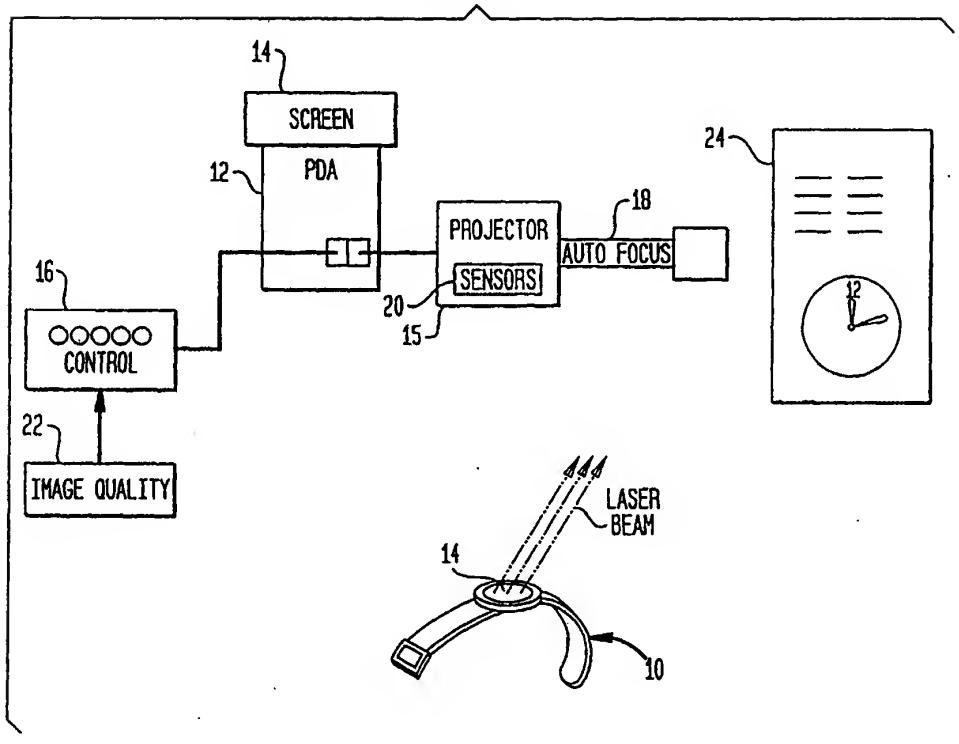

14
SCREEN
PDA
12
PROJECTOR
SENSORS
20
15
18
AUTO FOCUS
24
12
16
CONTROL
22
IMAGE QUALITY
LASER
BEAM
14
10

FIG. 2

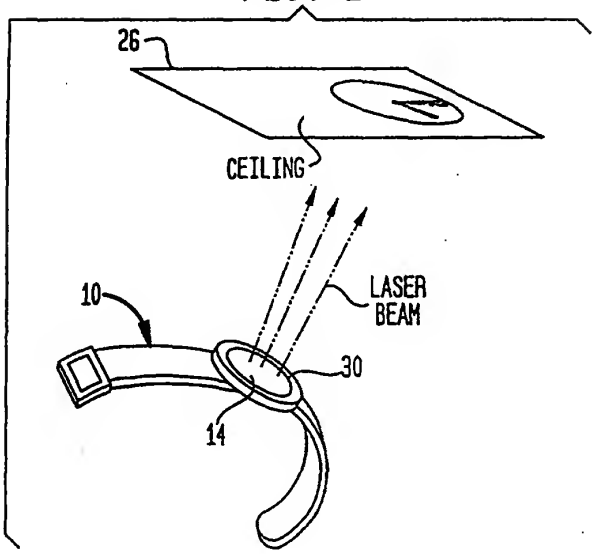


FIG. 3A

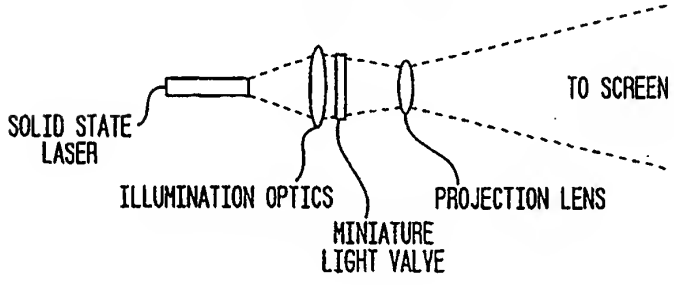


FIG. 3B

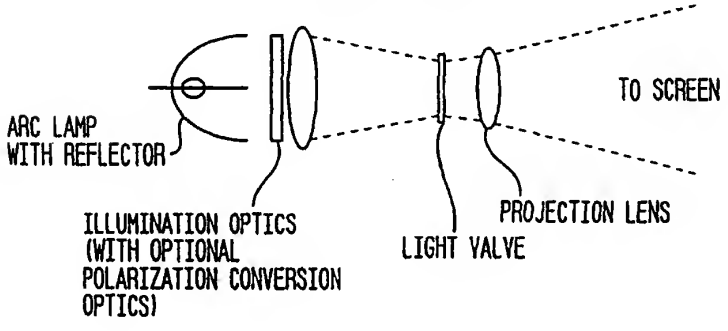


FIG. 4

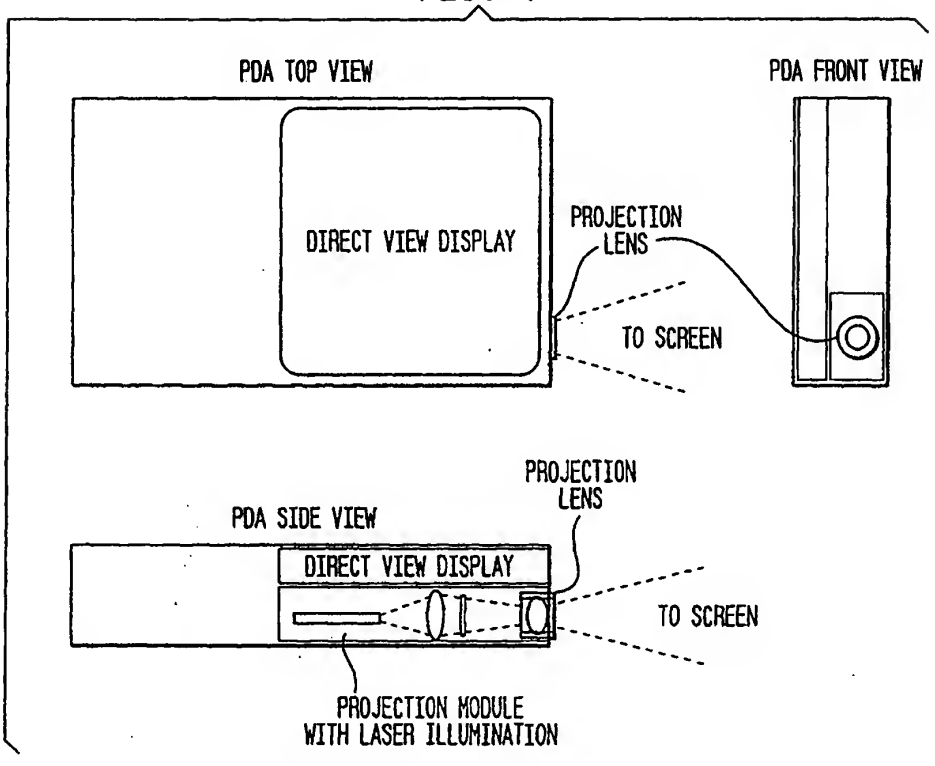

PDA TOP VIEW
PDA FRONT VIEW
DIRECT VIEW DISPLAY
PROJECTION LENS
TO SCREEN
PROJECTION LENS
PDA SIDE VIEW
DIRECT VIEW DISPLAY
TO SCREEN
PROJECTION MODULE WITH LASER ILLUMINATION

FIG. 5A

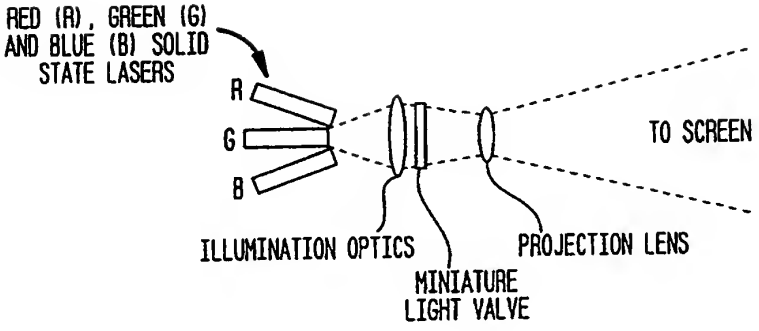

RED (R), GREEN (G)
AND BLUE (B) SOLID
STATE LASERS
R
G
B
TO SCREEN
ILLUMINATION OPTICS
PROJECTION LENS
MINIATURE
LIGHT VALVE

FIG. 5B

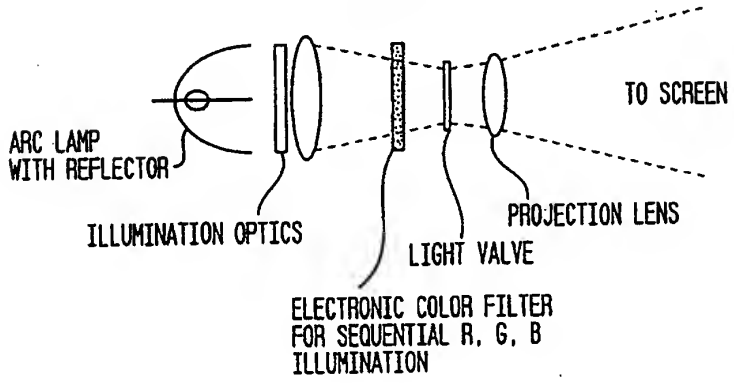
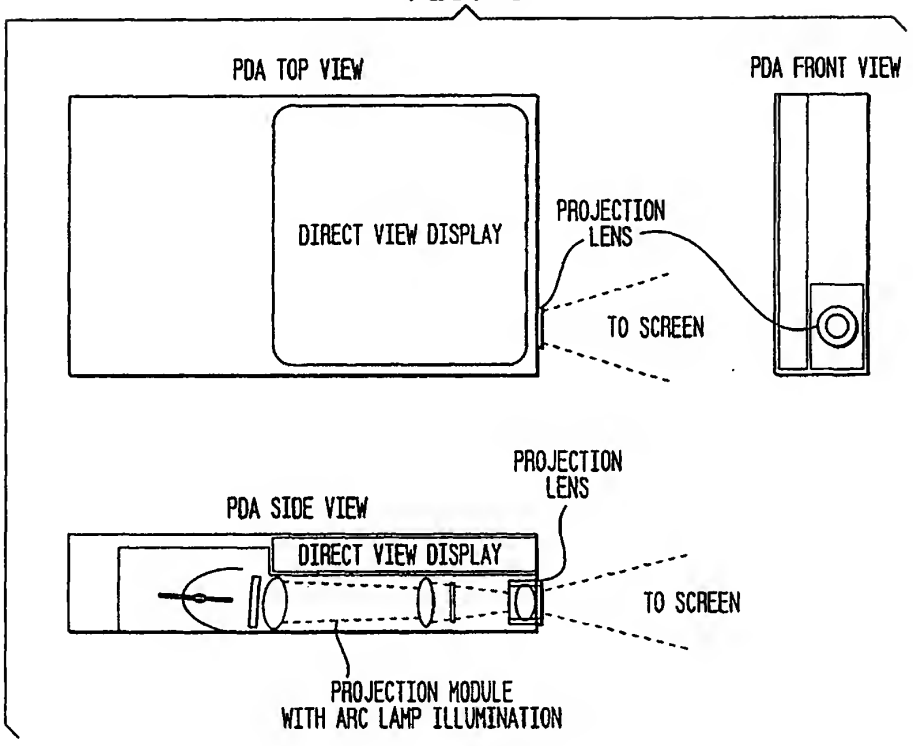

TO SCREEN
ARC LAMP
WITH REFLECTOR
ILLUMINATION OPTICS
PROJECTION LENS
LIGHT VALVE
ELECTRONIC COLOR FILTER
FOR SEQUENTIAL R, G, B
ILLUMINATION

FIG. 6


PDA TOP VIEW
PDA FRONT VIEW
DIRECT VIEW DISPLAY
PROJECTION LENS
TO SCREEN
PROJECTION LENS
PDA SIDE VIEW
DIRECT VIEW DISPLAY
TO SCREEN
PROJECTION MODULE WITH ARC LAMP ILLUMINATION

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 30 9999

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y	EP 0 818 764 A (MOTOROLA INC) 14 January 1998 (1998-01-14) * the whole document *	1-10	H04N9/31 H04N5/74
Y	EP 0 782 307 A (NOKIA MOBILE PHONES LTD) 2 July 1997 (1997-07-02) * column 3, line 4 - column 4, line 36 *	1-10	
Y	WO 97 42560 A (VIA INC) 13 November 1997 (1997-11-13) * page 24, line 2 - page 25, line 1 * * page 29, line 7 - page 30, line 10 *	1-10	
Y	WO 95 08132 A (PROXIMA CORP) 23 March 1995 (1995-03-23) * abstract; figure 1F * * page 77, line 3 - page 78, line 30 *	1-10	
P,Y	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 05, 14 September 2000 (2000-09-14) & JP 2000 050360 A (MATSUSHITA ELECTRIC WORKS LTD), 18 February 2000 (2000-02-18) * abstract *	1-5	TECHNICAL FIELDS SEARCHED (Int.Cl.7) H04N
A	PATENT ABSTRACTS OF JAPAN vol. 1996, no. 05, 31 May 1996 (1996-05-31) & JP 08 023501 A (FUJITSU GENERAL LTD), 23 January 1996 (1996-01-23) * abstract *	1-10	
A	EP 0 649 263 A (GOLD STAR CO) 19 April 1995 (1995-04-19) * abstract; figure 4 *	1-5	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14 February 2001	Pigniez, T

CATEGORY OF CITED DOCUMENTS

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14-02-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0818764 A	14-01-1998	CN 1172385 A	04-02-1998
		JP 10224256 A	21-08-1998
EP 0782307 A	02-07-1997	GB 2308486 A	25-06-1997
		US 6088068 A	11-07-2000
WO 9742560 A	13-11-1997	AU 3123997 A	26-11-1997
		EP 1008027 A	14-06-2000
		JP 2000512772 T	26-09-2000
WO 9508132 A	23-03-1995	US 5483382 A	09-01-1996
		US 5459484 A	17-10-1995
		US 5682181 A	28-10-1997
		US 5510861 A	23-04-1996
		AU 7799494 A	03-04-1995
		CA 2171961 A	23-03-1995
		EP 0719421 A	03-07-1996
		JP 9503313 T	31-03-1997
		US 5555002 A	10-09-1996
		US 5721565 A	24-02-1998
JP 2000050360 A	18-02-2000	NONE	
JP 08023501 0 A		NONE	
EP 0649263 A	19-04-1995	JP 7113997 A	02-05-1995
		KR 152779 B	15-10-1998
		US 5461437 A	24-10-1995

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